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PATENT
Customer Number 22,852
Attorney Docket No. 7040.0117.00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:)
Adamo SALA)
Application No. 10/042,184) Group Art Unit: 1733
Filed: January 11, 2002) Examiner: Knable, G.
For: TYRE-ASSEMBLING)
APPARATUS)

Mail Stop Petition
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

PETITION TO ACCEPT ORIGINALLY FILED APPLICATION

Applicant respectfully petitions the Commissioner for Patents under 37 C.F.R. § 1.181 to accept the originally filed application in this matter.

On January 11, 2002, Applicant filed U.S. Patent Application No. 10/042,184 (the '184 application) in the U.S. Patent and Trademark Office. The '184 application was filed as a continuation application of International Patent Application PCT/EP00/05972 (PCT '972), published as WO 01/08,874. Copies of the cover letter and stamped receipt card accompany this Petition.

As shown by the cover letter and stamped receipt card, the filing included, inter alia, a copy of PCT '972; a Preliminary Amendment, Appendix to Preliminary Amendment, and Abstract of the Disclosure; and an Information Disclosure Statement ("IDS"), with its Form PTO 1449 listing WO 98/52,740 (WO '740), among other documents. A copy of the Form PTO 1449 accompanies this Petition.

Application No. 10/042,184
Attorney Docket No. 7040.0117.00
Petition to Accept Originally Filed Application—Filed July 1, 2004

Applicant has since learned that the prosecution history file of the present application appears not to include a copy of PCT '972. Instead, it appears that the prosecution history file has inadvertently replaced the originally filed application (the specification of PCT '972) with the specification of WO '740. Additionally, it appears that the claims of WO '740 were inadvertently published in place of the claims of PCT '972, and that the Preliminary Amendment, Appendix to Preliminary Amendment, and Abstract of the Disclosure have been applied to the specification of WO '740 instead of the originally filed application.

Applicant respectfully requests that the originally filed application (the specification of PCT '972) replace the specification of WO '740; that the Preliminary Amendment, Appendix to Preliminary Amendment, and an Abstract of the Disclosure be applied to the originally filed application; and that WO '740 be associated with the IDS. To facilitate these corrections, copies of the following additional documents accompany this Petition: (1) PCT '972; (2) the Preliminary Amendment; (3) the Appendix to Preliminary Amendment; (4) the Abstract of the Disclosure; and (5) WO '740.

If any fee is required in connection with the filing of this Petition, please charge that fee to our Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.



By:

Lawrence F. Galvin
Reg. No. 44,694

Dated: July 1, 2004



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ERNEST F. CHAPMAN
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January 11, 2002

ATTORNEY DOCKET NO.: 07040.0117
CUSTOMER NUMBER: 22,852

**Box Patent Application
Assistant Commissioner for Patents
Washington, D.C. 20231**

New U.S. Patent Application
Title: **TYRE ASSEMBLING APPARATUS**
being a Continuation of PCT International
Application No. **PCT/EP00/05972**, filed on June 27, 2000
Inventor and Address:

1) **Adamo SALA**
Agrate Brianza (Milano), Italy

Dear Sir:

We enclose the following papers for filing in the United States Patent and Trademark Office under 35 U.S.C. 111(a) as a **Continuation** application of PCT International Application No. **PCT/EP00/05972**, filed on June 27, 2000, which claimed priority of European Patent Application No. 99830497.6 filed on July 30, 1999, and the benefit of U.S. Provisional Application No. 60/155,129, filed on September 22, 1999.

1. Application 28 pages, including 2 independent claims and 19 claims total (as amended).
2. Preliminary Amendment, including Appendix to Preliminary Amendment.
3. Abstract of the Disclosure.
4. Drawings 7 sheets of drawings containing 11 figures.
5. Copy of cover page of International Publication No. WO 01/08874.

Assistant Commissioner for Patents

January 11, 2002

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FINNEGAN
HENDERSON
FARABOW
GARRETT &
DUNNER LLP

6. Information Disclosure Statement and Information Disclosure Citation, PTO 1449 with documents attached.
7. The filing fee is calculated as follows:

| Basic Application Filing Fee | | | | | \$740 | \$740.00 |
|--|------------------|---|-------|--------------|--------|----------|
| | Number of Claims | | Basic | Extra Claims | | |
| Total Claims | 19 | - | 20 | 0 | x \$18 | |
| Independent Claims | 2 | - | 3 | 0 | x \$84 | |
| <input type="checkbox"/> Presentation of Multiple Dep. Claim | | | | | +\$280 | |
| Subtotal | | | | | \$ | 740.00 |
| Reduction by ½ if small entity | | | | | - | |
| TOTAL APPLICATION FILING FEE | | | | | \$ | 740.00 |

8. A check for \$740.00 is enclosed for the filing fee.

Applicant claims the right to priority based on European Patent Application No. 99830497.6 filed on July 30, 1999, and the benefit of U.S. Provisional Application No. 60/155,129, filed on September 22, 1999.

This application is being filed under the provisions of 37 C.F.R. § 1.53(f). Applicant awaits notification from the Patent and Trademark Office of the time set for filing the Declaration.

Please address all correspondence with respect to this application to:

Finnegan, Henderson, Farabow,
Garrett & Dunner, L.L.P.
1300 I Street, N.W.
Washington, D.C. 20005-3315

Please accord this application a serial number and filing date.

Assistant Commissioner for Patents

January 11, 2002

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FINNEGAN
HENDERSON
FARABOW
GARRETT &
DUNNER LLP

The Commissioner is hereby authorized to charge any additional filing fees due and any other fees due under 37 C.F.R. § 1.16 or § 1.17 during the pendency of this application to our Deposit Account No. 06-0916.

Sincerely,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

By:


Ernest F. Chapman

Reg. No. 25,961

EFC/FPD/sci
Enclosures



AJS/LXG/USC

PLEASE STAMP TO ACKNOWLEDGE RECEIPT OF THE FOLLOWING:

New U.S. Patent Application for: **TYRE ASSEMBLING APPARATUS** - being a Continuation of PCT International Application No. PCT/EP00/05972, filed on June 27, 2000

Inventor: **Adamo SALA**

BOX PATENT APPLICATION

1. Check for \$740.00
2. Transmittal Letter
3. Spec. 28 pgs. 2 indep. clms. and 19 clms. total (as amended)
4. Drawings - 7 sheets of drawings containing 11 figures
5. Preliminary Amendment, including Appendix to Preliminary Amendment
6. Abstract of the Disclosure
7. Copy of cover page of International Publication No. WO 01/08874
8. Information Disclosure Statement and Information Disclosure Citation, PTO1449 with documents attached

Dated January 11, 2002

Docket No.: 07040.0117

CUSTOMER NUMBER: 22,852

AJS/FPD/sci Mail Drop 360

(Due Date: January 30, 2002)



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1-14-02
JAS

INFORMATION DISCLOSURE CITATION

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| Atty. Docket No. | 07040.0117 | Serial No. | Not Yet Assigned |
| Applicant | Adamo SALA | JUL 01 2004 | |
| Filing Date | January 11, 2002 | Group: | Not Yet Assigned |

U.S. PATENT DOCUMENTS

| Examiner Initial* | Document Number | Issue Date | Name | Class | Sub Class | Filing Date If Appropriate |
|-------------------|-----------------|------------|----------------|-------|-----------|----------------------------|
| | 3,990,931 | 11/09/76 | LEBLOND et al. | | | |
| | 4,362,592 | 12/7/82 | RUPPEL | | | |
| | 3,887,423 | 06/03/75 | GAZUIT | | | |
| | | | | | | |
| | | | | | | |
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FOREIGN PATENT DOCUMENTS

| | Document Number | Publication Date | Country | Class | Sub Class | Translation Yes or No |
|--|-----------------|------------------|------------|-------|-----------|-----------------------|
| | 0 468 580 | 01/29/92 | EUROPE | | | |
| | 2 372 693 | 06/30/78 | FRANCE | | | NO |
| | 63 107 | 08/31/71 | LUXEMBOURG | | | NO |
| | 2.093.180 | 01/28/72 | FRANCE | | | NO |
| | WO 98/52740 | 11/26/98 | WIPO | | | |
| | | | | | | |
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OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

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| Examiner | Date Considered |
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*Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
8 February 2001 (08.02.2001)

PCT

(10) International Publication Number
WO 01/08874 A1

(51) International Patent Classification⁷: B29D 30/24. (74) Agent: TANSINI, Elio, Fabrizio; Bugnion S.p.A., Viale Lancetti, 17, I-20158 Milano (IT).

(21) International Application Number: PCT/EP00/05972 (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

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(25) Filing Language: English

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(30) Priority Data:
99830497.6 30 July 1999 (30.07.1999) EP
60/155,129 22 September 1999 (22.09.1999) US

(71) Applicant (*for all designated States except US*): PIRELLI PNEUMATICI S.P.A. [IT/IT]; Viale Sarca, 222, I-20126 Milano (IT).

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

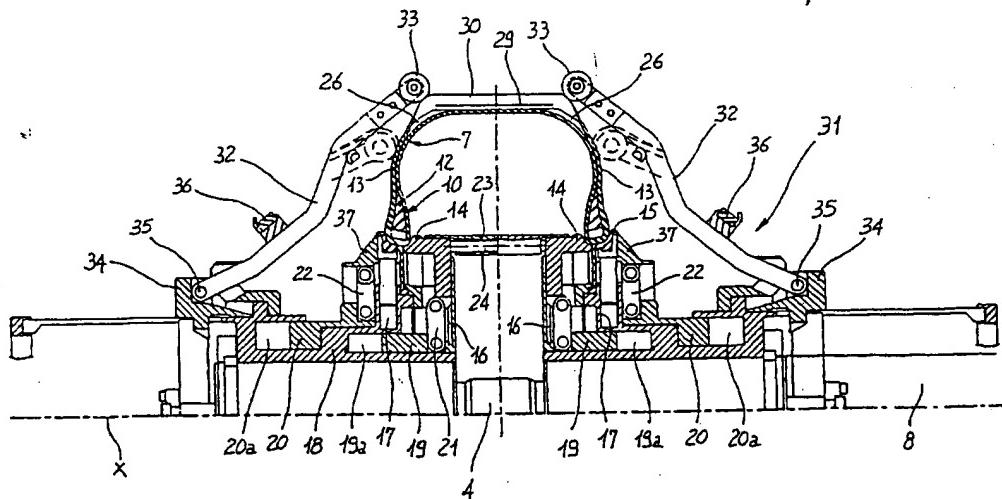
— With international search report.

(72) Inventor; and

(75) Inventor/Applicant (*for US only*): SALA, Adamo [IT/IT]; Via Ugo Foscolo, 46, I-20041 Agrate Brianza (IT).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: TYRE ASSEMBLING APPARATUS



TYRE ASSEMBLING APPARATUS

The present invention relates to a tyre assembling apparatus, comprising:

- 5 - an assembling drum having first and second halves that are axially opposed along a geometric axis of the drum itself, each of said halves comprising a plurality of circumferentially distributed radial sectors;
- 10 - radial-movement devices associated with each of said halves to selectively translate the corresponding sectors between a contracted condition in which they are disposed closer to the geometric axis of the drum and an expanded condition in which they are disposed spaced apart from the geometric axis of the drum;
- 15 - at least one axial-movement actuator to translate said halves relative to each other, between a condition in which they are moved close to each other and a condition in which they are moved apart from each other along the geometric axis of the drum.

20

As far as tyre manufacture for vehicle wheels is concerned, a so-called carcass sleeve is provided to be first made, which carcass sleeve is formed by winding up one or more carcass plies on a cylindrical drum.

25

Fitted on the side edges of the carcass ply or plies disposed in a cylindrical configuration are respective annular anchoring structures, each of them being usually made up of a so-called "bead wire" associated with an elastomer filling and intended for being incorporated into regions usually identified as "beads", formed from a turning-up action carried out on the side edges of the plies around the anchoring structures themselves.

Tyre manufacture also involves formation of a so-called belt package comprising one or more belt layers of textile and/or metallic material, with which a tread band is associated, at a radially outer position thereof. The belt package with the tread band is coaxially disposed around the carcass sleeve, and afterwards the carcass ply or plies are shaped in a toroidal configuration by mutual axial approaching of the tyre beads and simultaneous admission of fluid under pressure to the inside of the carcass sleeve so as to determine application of the belt package and tread band to the tyre carcass structure at a radially outer position thereof.

Several different apparatus have been developed and proposed for carrying out the above described operations at least partly.

For example, Italian Patent Application No. 25594 A/81 in the name of the same Applicant, describes an apparatus comprising an assembling drum made up of a plurality of radially expandable sectors to impose such an expansion to the carcass sleeve that engagement of the bead wires against the carcass plies is caused. Each sector has two side portions that are axially movable relative to a central portion, capable of enabling the cords forming the carcass ply or plies to be conveniently shaped around the radially inner portion of each bead wire. The carcass sleeve thus made lends itself to be transferred to a second assembling drum, where turning up of the side edges of the carcass plies around the annular anchoring structures will be carried out, as well as application of the belt package with the tread band.

In document US-4,362,592 it is provided that the carcass

sleeve formed on the assembling drum should have its side edges axially projecting in a cantilevered fashion from the drum side edges. In the proximity of the opposite sides of the drum is a pair of turning-up devices each comprising a plurality of levers circumferentially distributed around the geometric axis of the drum and movable towards the latter to carry out turning-up of the side edges of the carcass sleeve around the anchoring structures to the beads. In particular, the levers of each turning-up device are axially movable towards the drum starting from a rest condition in which they have an orientation converging towards the geometric axis of the drum itself. In a starting step of the movement, spreading apart of the levers is caused by effect of a guide surface of truncated conical form acting on abutment rollers associated with the levers themselves at a median point of their longitudinal extension. In a second step of the displacement, each lever acts by its free end on the side edge of the sleeve causing turning-up of same. The lever action on the side edge takes place through a spring extending according to a closed line passing through the free ends of all levers. A second spring circumscribing the levers in a median plane of the longitudinal extension of same ensures their coming back to the rest position. The sleeve thus made must be transferred to a further apparatus where application of the belt package and the tread band will be carried out.

Italian Patent Application No. 20467 A/82 in the name of the same Applicant herein mentioned as an example of the most pertinent state of the art, contemplates use of an assembling drum comprising first and second halves to be mutually moved close to each other along the geometric

axis of the drum. Each half has respective radially-expandable sectors, each defining a holding member made up of an axially inner portion and an axially outer portion to be moved close to each other in an axial direction to define an engagement seat for the bead wires associated with the carcass sleeve previously formed in another work station.

When engagement has occurred, the first and second halves of the assembling drum are moved close to each other so as to shape the carcass sleeve into a toroidal configuration, concurrently with inflation of air or other fluid thereinto.

In document US-3,887,423 a tyre manufacturing machine is described which has a drum essentially defined by a bladder expandable from a first operating condition, in which it is extended in a substantially cylindrical conformation, to a second operating condition in which it takes a toroidal conformation. A carcass sleeve is fitted on the drum in the first operating condition so that it projects from opposite sides past the drum by its side edges having a slightly smaller diameter than the maximum diameter of the drum itself. Two anchoring structures to the beads are placed on the carcass sleeve close to respective drum shoulders defined at the diametrical narrowing of the side edges of the carcass sleeve.

The side edges of the sleeve are disposed so as to bear on respective elastic tubular membranes within each of which a plurality of circumferentially-distributed levers operates, which levers are axially movable towards the drum to cause turning-up of the respective side edge around the annular anchoring structure, under the action

of pressure rollers acting on the inner face of the membrane.

When turning-up is over, the drum and carcass sleeve take
5 a toroidal conformation and the levers are operated again to determine application of the sidewalls previously laid down on the elastic membranes.

The present invention originates from the Applicant's perception that the present apparaata for tyre assembling
10 and related assembling method could be further improved, in particular in connection with the possibility of applying further components such as inserts of textile, metallic and/or elastomer materials to the region of the carcass sleeve included between the annular anchoring
15 structures, which inserts are intended for interacting with the belt package to be associated with the carcass sleeve.

More specifically, application of said components could
20 be carried out by means of devices such structured that they did not interfere with movement of the different drum parts during the step of shaping the carcass sleeve, thereby bringing about advantages on the quality of the finished product and the machinery productivity.

25 In more detail, it is an object of the present invention to provide a tyre assembling apparatus, characterized in that each of said sectors comprises: a holding member defining an engagement seat for an annular structure of anchoring to the bead being part of a carcass sleeve fitted on said drum; and a supporting member linked,
30 relative to said holding member, in a position axially internal to the latter and movable between a first

operating condition in which it is axially spaced apart from the holding member to offer a supporting seat to at least one ply being part of said carcass sleeve and a second operating condition in which it is disposed axially close to the holding member to enable mutual approaching of said halves.

In a preferential embodiment of the invention, it is advantageously provided that the supporting member should be slidably engaged along at least one guide rod extending in cantilevered fashion from said holding member.

In more detail, it is conveniently provided for the guide rod to extend in parallel to the geometric axis of the assembling drum. In addition, at least one elastic return member may be advantageously provided to be operatively associated with the supporting member to elastically urge it away from the holding member.

For instance, this elastic return member may comprise at least a return spring associated with said guide rod.

Preferably, the supporting members associated with the first and second halves respectively have abutment surfaces facing each other and spaced apart from each other by a smaller amount than the stroke carried out by said halves between their spaced apart condition and approaching condition.

Under this circumstance, each of said supporting members is susceptible of being translated towards the respective holding member following a thrust action against at least one of the supporting members associated

with the other half during mutual axial approaching of said halves.

5 Advantageously, the guide rods of the supporting members associated with the first half are angularly offset relative to the guide rods of the supporting members associated with the second half, so as to avoid mutual interferences between the rods themselves when the first and second halves are moved close to each other.

10 In accordance with a further preferential feature of the present invention, the supporting members associated with each of said halves, under a radially-expanded condition define a substantially continuous cylindrical surface.

15 For the purpose, it is preferably provided that each of said supporting members should have end slots slidably housing end projections provided on the circumferentially adjoining supporting members.

20 In a preferential embodiment, each of said holding members comprises an axially inner portion and an axially outer portion selectively movable, independently of each other, under the action of the radial-movement devices.

25 30 The radial-movement devices preferably comprise, for each of the halves of the assembling drum: a supporting hub coaxial with the geometric axis of the drum, slidably engaging the holding members of the respective sectors in a radial direction to said geometric axis; at least one radial-movement actuator operatively in engagement with said supporting hub and axially movable relative thereto; transmission connecting rods each operatively engaged between the radial-movement actuator and the holding

member of one of said sectors to give rise to a radial movement of the holding member following an axial movement transmitted by said radial-movement actuator.

In more detail, said radial-movement devices may be advantageously provided to comprise, for each of the assembling drum halves: a supporting hub coaxial with the geometric axis of the drum; first guide elements for slidably engaging the axially inner portions of the holding members with the supporting hub, in a radial direction to said geometrical axis; at least one first radial-movement actuator operatively in engagement with said supporting hub and axially movable relative thereto; first transmission connecting rods each operatively engaged between the first radial-movement actuator and one of said axially inner portions to give rise to a radial movement of said one radially inner portion following an axial movement transmitted by said first radial-movement actuator; second guide elements for slidable engagement of the axially outer portions of the holding members with the supporting hub, in a radial direction to said geometric axis; at least one second radial-movement actuator operatively in engagement with said supporting hub and axially movable relative thereto; second transmission connecting rods each operatively engaged between the second radial-movement actuator and one of said axially outer portions to give rise to a radial movement of said one axially outer portion following an axial movement transmitted by said second radial-movement actuator.

30

It may be also advantageously provided that in the radial sectors of each of said first and second halves, powered axially inner portion operated by said radial-movement

devices and driven axially inner portions dragged along in the radial movement of the powered axially inner portions, should be identified.

5 In accordance with a further aspect of the present invention, at least a turning-up device is advantageously provided to be associated with each of said first and second halves, to turn up a side edge of the carcass sleeve around the respective annular anchoring structure.
10 Advantageously, each turning-up device comprises: a plurality of turning-up levers circumferentially distributed around the geometric axis of the drum, each carrying a pressure element facing the drum; at least one driving member rotatably engaging each of said turning-up
15 levers at a point spaced apart from said pressure element; operation devices to axially translate the driving member between a rest position in which it is axially spaced apart from the radial sectors of the drum and a work position in which it is disposed close to said
20 radial sectors.

In a preferential embodiment, the hinging point of each of said turning-up levers on the driving member has, relative to the geometric axis of the drum, a radial distance smaller than the radial distance measurable on the corresponding pressure element when the driving member is in its rest position.

25 In addition, the holding member of each sector is advantageously provided to have, at an axially outer position relative to the drum, a lead-in surface converging towards the geometric axis of the drum and facing the pressure element carried by at least one of

said turning-up levers.

Preferably, each turning-up device further comprises at least one elastic element extending around the geometric axis of the drum and operating on said turning-up levers to transmit to the latter a radial-thrust action towards the geometric axis of the drum itself.

Further features and advantages will become more apparent from the detailed description of a preferred but non-exclusive embodiment of a tyre assembling apparatus in accordance with the present invention. This description will be taken hereinafter with reference to the accompanying drawings, given by way of non-limiting example, in which:

- Fig. 1 is an axial half section of the apparatus of the present invention, under rest conditions;
- Fig. 2 shows the apparatus of Fig. 1 in an operating condition in which a carcass sleeve has been coaxially fitted onto the assembling drum;
- Fig. 3 is a partial section of the apparatus in an operating condition in which the axially inner portions of the holding members being part of the drum sectors have been radially spaced apart to engage the carcass sleeve;
- Fig. 4 shows the apparatus in a step subsequent to Fig. 3, in which engagement of the carcass sleeve has been completed, following the radial expansion of the axially outer portions of the drum sectors, and lying down of under-belt strips onto the carcass sleeve has been carried out;
- Fig. 5 shows a further operating step in which the carcass sleeve has taken a toroidal conformation,

following mutual approach of the anchoring structures to the beads, and coupling between a belt package with a tread band on the carcass sleeve has been carried out;

5 - Fig. 6 shows an operating step in which turning-up of the sidewalls and side edges of the carcass sleeve around the annular anchoring structures to the beads is being carried out;

10 - Fig. 7 shows, in a partly interrupted diametrical section, the axially inner portions of the holding members of the sectors of one of the drum portions, under a retracted condition;

- Fig. 8 shows the axially inner portions of the holding members in an expanded condition;

15 - Fig. 9 shows in an axial section, the supporting portions associated with the radial sectors of the drum, the drum halves being spaced apart from each other;

- Fig. 10 shows the supporting portions of Fig. 8 with the drum halves in a mutual-approaching condition;

20 - Fig. 11 is an elevational partial view showing the mutual engagement between circumferentially contiguous supporting members being part of the radial sectors of the assembling drum.

With reference to the cited drawings, a tyre assembling apparatus in accordance with the present invention has 25 been generally identified by reference sign 1.

Apparatus 1 comprises an assembling drum 2 having first and second halves 3a, 3b axially opposed along a geometric axis X of the drum itself and susceptible of simultaneous translation, along geometric axis X, between 30 a mutually spaced apart condition, shown in Figs. 1 and 2 for example, and a mutually approached condition, shown

in Figs. 5 and 6 for example, upon command of at least one axial-movement actuator 4.

Each of halves 3a, 3b comprises a plurality of radial sectors 5 circumferentially distributed around geometric axis X and susceptible of translation, upon command of radial-movement devices generally denoted by reference sign 6, between a contracted condition in which, as shown in Fig. 1, they are approached to geometric axis X and an expanded condition in which, as shown in Fig. 4 for example, they are radially spaced apart from the geometric axis itself.

Assembling drum 2 is adapted to receive a carcass sleeve 7 previously formed in a cylindrical conformation during a preceding working step. This carcass sleeve 7 may for example comprise one or more carcass plies 9 disposed in a cylindrical conformation, and a pair of anchoring structures to beads 10 each essentially comprising at least one so-called bead wire 11 provided with an elastomer filling 12 at a radially outer position relative to said bead wire 11.

Additional components may be previously applied to the inner surface of carcass ply or plies 9, which components may be for example at least one layer of raw elastomer material, adapted to form a so-called "liner" for example, and extending until close to annular anchoring structures 10, a pair of strips of elastomer material adapted to constitute tyre side walls 13, applied to respective side edges 7a, 7b of sleeve 7, as well as possible textile or metallic reinforcing strips placed at the overlapping region between the liner and each of the above-mentioned side walls.

As shown in Fig. 2, carcass sleeve 7, engaged on the outer surface of a first transfer ring (not shown), technically defined as first-step transfer, can be coaxially fitted on assembling drum 2, supported in cantilevered fashion at a central shaft 8 and such arranged that halves 3a and 3b are mutually spaced apart and radial sectors 5 are in the contracted condition, as shown in Fig. 1.

Once positioning of carcass sleeve 7 on assembling drum 2 has been carried out, radial sectors 5 of the latter are brought to the expanded condition to firmly hold the sleeve itself close to annular anchoring structures 10 (Fig. 3).

In more detail, for the purpose it is provided for each radial sector 5 to have a holding member 14, 15 (Fig. 2) defining a seat for engagement of sleeve 7 close to one of annular anchoring structures 10. This holding member 14, 15 preferably comprises an axially inner portion 14 and an axially outer portion 15, selectively movable, independently of each other, under the action of radial-movement devices 6.

For this purpose, radial-movement devices 6 advantageously comprise first and second guide elements 16, 17 (Fig. 2) by means of which axially inner portion 14 and axially outer portion 15 are slidably in engagement, in a direction radial to geometric axis X, with a supporting hub 18 coaxial with the geometric axis itself. Operatively engaged in supporting hub 18 are at least a first and a second radial-movement actuators 19, 20 (Fig. 2), of annular conformation for example, axially movable relative to the hub itself, under the action of

a working fluid admitted to respective annular chambers 19a, 20a.

Also provided are first transmission connecting rods 21 each engaged between first radial-movement actuator 19 and one of axially inner portions 14, as well as second transmission connecting rods 22 each engaged between second radial-movement actuator 20 and one of axially outer portions 15. Each of first and second transmission connecting rods 21, 22 lends itself to cause a radial movement of respective axially inner 14 or outer 15 portions, following an axial movement transmitted by first and second radial movement actuators 19, 20, respectively.

It may be advantageously provided that in the plurality of axially inner portions 14 of radial sectors 5 belonging to each of halves 3a and 3b of drum 2, powered axially inner portions and driven axially inner portions following each other in an alternated sequence along the circumferential extension of the drum itself should be identified. Said powered and driven axially inner portions have been denoted by 14a and 14b respectively in Figs. 1, 7 and 8. As shown in Fig. 1, powered axially inner portions 14a are directly submitted to the action of radial movement devices 6, by means of respective first transmission connecting rods 21, whereas driven axially inner portions 14b are dragged along in the radial movement imposed to operated axially inner portions 14a. The dragging action preferably takes place by means of mutually mating sliding surfaces respectively associated with powered 14a and driven 14b axially inner portions, as clearly shown in Figs. 7 and 8.

The operating sequence for engaging sleeve 2 by means of holding members 14, 15 first contemplates operation of first radial-movement actuators 19 to cause radial expansion of axially inner portions 14 of each sector 5. Under this situation, as shown in Fig. 3, radially inner portions 14 engage carcass sleeve 7 close to the axially inner regions of annular anchoring structures 10. It may be provided that the radial expansion of radially inner portions 14 should be followed by a slight mutual moving apart of halves 3, under the action of axial-movement actuator 4, to cause an appropriate tensioning of carcass plies 9 at the section included between annular anchoring structures 10. Next second radial-movement actuators 20 are operated to cause the radial expansion of axially outer portions 15, thereby completing engagement of carcass sleeve 7 by radial sectors 5 close to both annular anchoring structures 10 as shown in Fig. 4. Advantageously, respective supporting members 23 are associated with radial sectors 5, said supporting members being placed at an axially inner position relative to respective holding members 14, 15. These supporting members 23 lend themselves to define, when sectors 5 are in a radial-expansion condition, at least one substantially continuous cylindrical surface so as to provide a supporting seat for carcass ply or plies 9 at the regions included between annular anchoring structures 10.

In more detail, each supporting member 23 is operatively connected to holding member 14, 15 of respective sector 5, and is movable between a first operating condition in which, as shown in Figs. 1 to 4, it is axially spaced apart from the holding member itself to provide a

supporting seat for carcass ply 9, and a second operating condition in which, as shown in Figs. 5 and 6, it is axially approached to holding member 14, 15 to enable mutual approaching of halves 3a and 3b of drum 2. Preferably, supporting member 23 is slidably engaged along at least one guide rod 24 extending in cantilevered fashion from respective holding member 14, 15, parallelly of geometric axis X of assembling drum 2.

Associated with supporting member 23 is one or more elastic return elements constantly urging member 23 to a condition spaced apart from respective holding member 14, 15. In detail, in the example shown a return spring 25 (only partly illustrated) is provided for the purpose, which spring is coaxially disposed on guide rod 24. The support provided to carcass ply or plies 9 by supporting elements 23 makes it advantageously possible to apply to the region included between annular anchoring structures 10 of carcass sleeve 7, extended in a cylindrical conformation, one or more additional elements to be integrated into the tyre structure. These additional elements may comprise filling and/or reinforcing ribbon-like elements 26, the so-called "under-belt strips" for example (Fig. 4), intended for being incorporated under the side edges of a belt package, close to the tyre shoulders. In particular, it is possible to carry out application of these ribbon-like elements by a winding action and a simultaneous rolling action around geometric axis X of drum 2, while the latter is being driven in rotation, without the risk that stresses and/or anomalous deformations be produced on the carcass plies.

In order to provide carcass ply or plies 9 with a supporting surface as much as possible continuous and homogeneous, each of supporting members 23 is advantageously provided with end slots 27 which slidably house end projections 28, mating with said slots and provided on circumferentially contiguous supporting members 23, as clearly shown in Fig. 11.

When application of ribbon-like elements 26 has been completed, assembling drum 2 is moved to a different working station for shaping and completing the tyre carcass structure. During said displacement the toroidal conformation of carcass sleeve 7 begins by mutual approaching of halves 3a and 3b, concurrently with air or other working fluid admission to the inside of carcass sleeve 7, in such a manner that said sleeve takes a toroidal conformation of increasingly growing diameter. Once the sleeve has been positioned in said working station, it receives a so-called belt package 29 coupled with a tread band 30 disposed at a radially outer position of said belt package 29. Belt package 29, comprising one or more belt layers of textile and/or metallic material, and tread band 30 are obtained on a further drum (not shown), in a different station of the manufacturing machine, and positioned on carcass sleeve 7 with the aid of a second transfer ring (not shown) coaxially fitted on the drum. Said further drum and second transfer ring are not described in detail because they are not part of the present invention. Belt package 29 and tread band 30 are positioned at a centered location around carcass sleeve 7 by axial insertion on assembling drum 2 through said second transfer ring provided with grip members acting on the outer surface of

the tread band itself. Conformation goes on until the radially outer surface of the carcass sleeve adheres to the radially inner surface of belt package 29 (as shown in Figs. 5 and 6). At this point the grip members of the 5 second transfer ring are detached from the tread band surface and the transfer ring is moved away.

Supporting members 23, associated with first 3a and 10 second 3b halves respectively, have abutment surfaces 23a facing each other and respectively moved apart from each other by an amount smaller than the stroke carried out by said halves when they translate from their mutually-spaced apart condition to their mutually-approached condition.

15 Consequently, during translation of halves 3a and 3b towards the mutual-approaching condition, supporting members 23 abut against each other by their respective abutment surfaces 23a. As axial mutual approaching of halves 3a and 3b goes on, each of supporting members 23 moves towards respective holding member 14, 15 and 20 presses spring 25 fitted on guide rod 24, by effect of the thrust action mutually exchanged with one or more of supporting members 23 associated with the other half.

25 Advantageously, guide rods 24 of supporting members 23 associated with first half 3a are angularly offset relative to guide rods 24 of supporting members 23 associated with the other half 3b. In other words, guide rods 24 of supporting members 23 associated with one and 30 the other halves 3a and 3b respectively, are angularly offset relative to each other around geometric axis X. Thus, any possibility of mutual interference between guide rods 24 when halves 3a and 3b are brought into

mutual-approaching relationship is eliminated.

In accordance with a further aspect of the present invention, advantageously associated with first 3a and second 3b halves are respective turning-up devices 31, under the action of which side edges 7a, 7b of carcass sleeve 7 are turned up around respective annular anchoring structures 10, and more specifically around bead wires 11 of said structures, to complete tyre manufacturing.

Each turning-up device 31 comprises a plurality of turning-up levers 32 circumferentially distributed around geometric axis X of drum 2. In the accompanying drawings, one turning-up lever alone 32 for each of turning-up devices 31 is shown.

Each turning-up lever 32 substantially lies in a diametrical plane containing geometric axis X and carries, at one free end thereof, at least one pressure element 33, comprising a roller for example, which is turned towards the middle plane of drum 2, the rotation axis of said pressure element 33 being disposed parallelly of said middle plane and perpendicular to said diametrical plane. In more detail, each pressure element 33 is positioned close to one of radial sectors 5, at an axially outer position relative to holding member 14, 15 being part of the sector itself.

Each turning-up device 31 further comprises at least one driving member 34 rotatably engaging each of turning-up levers 32 at a second end thereof or at another hinging point 35 spaced apart from pressure element 33. This driving member 34 can be activated by an operation device

comprising a fluid-operated actuator for example, which
is coaxially housed in drum 2 and not shown because it
can be made in any convenient manner, which actuator
causes the driving member to axially translate from a
rest position in which, as shown in Figs. 1 to 5, it is
spaced apart from radial sectors 5 belonging to the
respective half, and a working position in which, as
shown in Fig. 6, it is disposed axially close to said
radial sectors.

As clearly shown in Fig. 6, following translation of
driving members 34 to the working position, turning-up
levers 32 progressively slant while rotating around their
hinging points 35, and respective pressure elements 33
cause turning-up of side edges 7a, 7b around anchoring
structures 10, radially travelling along tyre side walls
13 away from geometric axis X until they reach tread band
30.

The above-described movement takes place against the
action of at least one elastic element 36, consisting of
an elastomeric ring for example, extending around
geometric axis X and operating on turning-up levers 32 to
transmit to said levers a radial thrust action towards
the geometric axis itself. Due to the presence of this
elastic element 36 a homogeneous thrust action of
pressure elements 33 against respective tyre side wall 13
is ensured and a simultaneous movement of the levers
themselves during both the going stroke and return stroke
to the rest position is promoted.

It is advantageously provided that, when the driving
member 34 is at its rest position, turning-up levers 32
preferably extend in the form of a broken line

substantially diverging from geometric axis X at radial sectors 5, as shown in Figs. 1 to 5. Hinging point 35 of each of turning-up levers 32 consequently has a radial distance, relative to geometric axis X, which is smaller than the radial distance measured on corresponding pressure element 33.

It is also preferably provided that radial sectors 5, at an axially outer position, should have respective lead-in surfaces 37 converging towards geometric axis X and facing pressure elements 33. In detail, lead-in surfaces 37 are preferably formed on the axially outer positions of holding members 14, 15 being part of respective radial sectors 5.

Orientation of turning-up levers 32, as well as the presence of lead-in surfaces 37 are favourable for reaching an excellent control on turning-up lever 32 movements, above all at the starting instants of translation of driving members 34 from the rest position. In particular, a slight displacement of the driving members from the rest position can be caused before the step of mutual approaching of halves 3a and 3b of drum 2 begins. Under this situation, pressure elements 33 are brought to a radially outer position relative to lead-in surfaces 37, causing an initial turning-up of side edges 7a, 7b around bead wires 11. Thus, there is eliminated the risk that the cords forming carcass ply or plies 9 may be submitted to undesirable displacements and/or anomalous stresses during the mutual approaching of halves 3a and 3b giving rise to the toroidal conformation of sleeve 7.

- The present invention achieves important advantages. In fact, the expedients proposed by the invention enable supporting members 23 to be arranged without the risk that the presence of said members may be a hindrance to a correct movement of each of halves 3a and 3b of drum 2, in particular during the step of mutual approaching of said halves for giving a toroidal conformation to carcass sleeve 7.
- It should be also appreciated that, in spite of the presence of supporting members 23, apparatus 1 has a great structural simplicity, which results in advantages in terms of easy servicing and setting.
- Moreover, the inclined orientation of turning-up levers 32 at their rest position too, in addition to the above-described advantages, enables the axial sizes of apparatus 2 as a whole to be advantageously reduced. It will be also recognized that since the turning-up levers have the conformation of a broken line, the risk that they may undesirably come into contact with the tyre, above all at the shoulder regions when pressure elements 33 operate on tread band 30, is eliminated.
- In addition, lead-in surfaces 37 promote the starting contact of pressure elements 33 with the carcass side, enabling said elements to slide along said side in a uniform manner and without discontinuity.

C L A I M S

1. A tyre assembling apparatus, comprising:

- an assembling drum (2) having first (3a) and second (3b) halves that are axially opposed along a geometric axis (X) of the drum itself, each of said halves (3a, 3b) comprising a plurality of circumferentially distributed radial sectors (5);
 - radial-movement devices (6) associated with each of said halves (3a, 3b) to selectively translate the corresponding sectors (5) between a contracted condition in which they are disposed closer to the geometric axis (X) of the drum (2) and an expanded condition in which they are disposed spaced apart from the geometric axis (X) of the drum (2);
 - at least one axial-movement actuator (4) to translate said halves (3a, 3b) relative to each other, between a condition in which they are close to each other and a condition in which they are spaced apart from each other along the geometric axis (X) of the drum (2);
- characterized in that each of said sectors (5), comprises:
- a holding member (14, 15) defining an engagement seat of an annular anchoring structure to the bead (10) being part of a carcass sleeve (7) fitted on said drum (2); and
 - a supporting member (23) linked, relative to said holding member (14, 15), in a position axially internal to the latter and movable between a first operating condition in which it is axially spaced apart from the holding member to provide a supporting seat to at least one ply being part of said carcass sleeve (7) and a second operating condition in which it is disposed axially close to the holding member to enable mutual approaching of said halves (3a, 3b).

2. Apparatus as claimed in claim 1, wherein said supporting member (23) is slidably engaged along at least one guide rod (24) extending in cantilevered fashion from said holding member (14, 15).
- 5 3. Apparatus as claimed in claim 2, wherein said guide rod (24) extends in parallel to the geometric axis (X) of the assembling drum (2).
- 10 4. Apparatus as claimed in claim 1, comprising at least one elastic return member (25) operatively associated with the supporting member (23) to elastically urge it away from the holding member (14, 15).
- 15 5. Apparatus as claimed in claim 2, comprising at least one return spring (25) associated with said guide rod (24) to elastically urge the supporting member (23) apart from the holding member (14, 15).
- 20 6. Apparatus as claimed in claim 2, wherein the guide rods (24) of the supporting members (23) associated with the first (3a) and second (3b) halves respectively, are angularly offset relative to each other.
- 25 7. Apparatus as claimed in claim 1, wherein the supporting members (23) associated with the first (3a) and second (3b) halves respectively, have abutment surfaces (23a) facing each other and spaced apart from each other respectively by an amount smaller than the stroke carried out by said halves between their spaced apart condition and approaching condition.
- 30 8. Apparatus as claimed in claim 1, wherein the supporting members (23) of each of said halves (3a, 3b)

are susceptible of being translated towards the respective holding members (14, 15) following a thrust action against the supporting members (23) associated with the other half during mutual axial approaching of
5 said halves.

9. Apparatus as claimed in claim 1, wherein the supporting members (23) associated with each of said halves (3a, 3b), under a radially-expanded condition
10 define a substantially continuous cylindrical supporting surface.

10. Apparatus as claimed in claim 1, wherein each of said supporting members (23) has end slots (27) slidably housing end projections (28) provided on the circumferentially adjoining supporting members (23).

11. Apparatus as claimed in claim 1, wherein each of said holding members (14, 15) comprises an axially inner portion (14) and an axially outer portion (15) movable selectively and independently of each other, under the
20 action of the radial-movement devices (6).

12. Apparatus as claimed in claim 1, wherein said radial-movement devices (6) comprise, for each of the halves
25 (3a, 3b) of the assembling drum (2):

- a supporting hub (18) coaxial with the geometric axis (X) of the drum (2), slidably engaging the holding members (14, 15) of the respective sectors (5) in a radial direction to said geometric axis (X);
- at least one radial-movement actuator (19, 20) operatively in engagement with said supporting hub (18) and axially movable relative thereto;

transmission connecting rods (21, 22) each operatively engaged between the radial-movement actuator (19, 20) and the holding member (14, 15) of one of said radial sectors (5) to give rise to a radial movement of the holding member (14, 15) following an axial movement transmitted by said radial-movement actuator (19, 20).

13. Apparatus as claimed in claim 11, wherein said radial-movement devices (6) comprise, for each of the halves (3a, 3b) of the assembling drum (2):

- a supporting hub (18) coaxial with the geometric axis (X) of the drum (2);
 - first guide elements (16) for slidably engaging the axially inner portions (14) of the holding members (14, 15) with the supporting hub (18), in a radial direction to said geometrical axis (X);
 - at least one first radial-movement actuator (19) operatively in engagement with said supporting hub (18) and axially movable relative thereto;
 - first transmission connecting rods (21), each operatively engaged between the first radial-movement actuator (19) and one of said axially inner portions (14) to give rise to a radial movement of said one radially inner portion following an axial movement transmitted by said first radial-movement actuator (19);
 - second guide elements (17) for slideable engagement of the axially outer portions (15) of the holding members (14, 15) with the supporting hub (18), in a radial direction to said geometric axis (X);
 - at least one second radial-movement actuator (20) operatively in engagement with said supporting hub (18) and axially movable relative thereto;
- 30 second transmission connecting rods (22) each operatively

engaged between the second radial-movement actuator (20) and one of said axially outer portions (15) to give rise to a radial movement of said one axially outer portion following an axial movement transmitted by said second radial-movement actuator (20).

14. Apparatus as claimed in claim 13, wherein in the radial sectors (5) of each of said first (3a) and second (3b) halves, are present axially inner powered portions (14a) operated by said radial-movement devices and driven axially inner portions (14b) dragged along in the radial movement of the powered axially inner portions (14a).

15. Tyre assembling apparatus according to claim 1, wherein at least one turning-up device (31) is associated with each of said first (3a) and second (3b) halves, to turn up a side edge (7a, 7b) of the carcass sleeve (8) around the respective annular anchoring structure (10).

16. Apparatus as claimed in claim 15, wherein each turning-up device (31) comprises:

- a plurality of turning-up levers (32) circumferentially distributed around the geometric axis (X) of the drum (2), each carrying a pressure element (33) facing the drum (2);
- at least one driving member (34) rotatably engaging each of said turning-up levers (32) at a hinging point (35) spaced apart from said pressure element (33);
- operation devices to axially translate the driving member (34) between a rest position in which it is axially spaced apart from the radial sectors (5) and a working position in which it is disposed close to said radial sectors.

17. Apparatus as claimed in claim 16, wherein the hinging point (35) of each of said turning-up levers (32) on the driving member (34) has, relative to the geometric axis (X) of the drum (2), a radial distance smaller than the radial distance measurable on the corresponding pressure element (33) when the driving member (34) is in its rest position.
18. Apparatus as claimed in claim 16, wherein the holding member (14, 15) of each radial sector (5) has, at an axially outer position, a lead-in surface (37) converging towards the geometric axis (X) of the drum (2) and facing the pressure element (33) carried by at least one of said turning-up levers (32).
19. Apparatus as claimed in claim 16, wherein each turning-up device (31) comprises at least one elastic element (36) extending around the geometric axis (X) of the drum (2) and operating on said turning-up levers (32) to transmit to the latter a radial-thrust action towards the geometric axis (X) of the drum itself.

PATENT
Customer Number 22,852
Attorney Docket No. 7040.0117.00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:)
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Adamo SALA)
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Serial No.: Not yet assigned) Group Art Unit: Not yet assigned
)
)
Filed: January 11, 2002) Examiner: Not yet assigned
)
)
For: TYRE ASSEMBLING APPARATUS)

Assistant Commissioner for Patents
Washington, DC 20231

Sir:

PRELIMINARY AMENDMENT

Prior to the examination of the above-captioned application, please amend this application as follows:

IN THE TITLE:

Please amend the title, as follows:

TYRE-ASSEMBLING APPARATUS

IN THE SPECIFICATION:

Please amend the specification, as follows:

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Add two section headings, a section subheading, and a paragraph immediately after the new title TYRE-ASSEMBLING APPARATUS, as follows:

--CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation application of International Application No. PCT/EP00/05972, filed June 27, 2000, in the European Patent Office, the contents of which are relied upon and incorporated herein by reference; additionally, Applicant claims the right of priority under 35 U.S.C. § 119(a) - (d) based on patent application No. 99830497.6, filed July 30, 1999, in the European Patent Office; further, Applicant claims the benefit under 35 U.S.C. § 119(e) based on prior-filed, copending provisional application No. 60/155,129, filed September 22, 1999, in the U.S. Patent and Trademark Office.

BACKGROUND OF THE INVENTION

Field of the Invention--

Page 1, line 20, add section subheading **--Description of the Related Art--** prior to the start of the paragraph beginning "As far as tyre manufacture"

Page 5, line 8, insert the following paragraph and section heading prior to the start of the paragraph beginning "The present invention originates"

--U.S. Patent No. 3,990,931 discloses a tyre assembling drum provided with pairs of pivotable arms journalled each at one end to a respective half of the drum, and joined to each

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other at a pivoting connection laying in an equatorial plane. The pivotable arms are subjected to radially expand in the region of their mutual linking connection, when the halves approach each other to conform the carcass tyre in a toroidal shape.

SUMMARY OF THE INVENTION--

Page 5, line 26 - page 6, line 6, amend the paragraph beginning "In more detail, it is an object of the present invention . . .", as follows:

In more detail, the present invention provides a tyre assembling apparatus, wherein each of said sectors comprises: a holding member defining an engagement seat of an annular structure for anchoring to the bead-part of a carcass sleeve fitted on said drum; and a supporting member linked, relative to said holding member, in a position axially internal to the latter and movable between a first operating condition, in which it is axially spaced apart from the holding member to offer a supporting seat to at least one ply being part of said carcass sleeve, and a second operating condition, in which it is disposed close to the holding member to enable mutual approaching of said halves. The supporting members associated with the first and second halves, respectively, have abutment surfaces both facing each other and spaced apart from each other by a smaller amount than the stroke carried out by said halves between their spaced-apart condition and their approaching condition. The respective abutment surfaces of the supporting members abut against each other in the approaching condition.

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Page 6, lines 23-28, delete in its entirety the paragraph beginning "Preferably, the supporting members associated with the first and second halves"

Page 10, line 8, add section heading --BRIEF DESCRIPTION OF THE DRAWINGS-- prior to the start of the paragraph beginning "Further features and advantages"

Page 11, line 23, add section heading --DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS-- prior to the start of the paragraph beginning "With reference to the cited drawings"

Add a new page 29 after the claims, adding the following ABSTRACT OF THE DISCLOSURE. A new, separate page 29 including the ABSTRACT OF THE DISCLOSURE is enclosed.

--ABSTRACT OF THE DISCLOSURE

A tyre-assembling apparatus includes an assembling drum, radial-movement devices, and at least one axial-movement actuator. The assembling drum includes first and second halves axially opposed along a geometric axis of the drum. Each of the halves includes a plurality of circumferentially-distributed radial sectors. The radial-movement devices associated with each of the halves selectively translate corresponding radial sectors between a contracted condition and an expanded condition. The at least one axial-movement actuator translates the halves relative to each other between an approaching condition and a spaced-apart condition. Each of the radial sectors includes a holding member and a supporting member. The holding member

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defines an engagement seat of an annular anchoring structure to a bead-part of a carcass sleeve fitted on the drum. The supporting member is linked, relative to the holding member, in a position axially-internal to the holding member and movable between first and second operating conditions.--

IN THE CLAIMS:

Please cancel, without prejudice or disclaimer, claims 2-19, and add new claims 20-37, as follows:

--20. (new) A tyre-assembling apparatus, comprising:
an assembling drum comprising first and second halves axially opposed along a geometric axis of the drum, each of the halves comprising a plurality of circumferentially-distributed radial sectors;
radial-movement devices associated with each of the halves to selectively translate corresponding radial sectors between a contracted condition, wherein the radial sectors are disposed closer to the geometric axis of the drum, and an expanded condition, wherein the radial sectors are disposed spaced apart from the geometric axis of the drum; and
at least one axial-movement actuator to translate the halves relative to each other between an approaching condition, wherein the halves are close to each other, and a spaced-apart condition, wherein the halves are spaced apart from each other along the geometric axis of the drum;
wherein each of the radial sectors comprises:

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a holding member, defining an engagement seat of an annular anchoring structure to a bead-part of a carcass sleeve fitted on the drum; and

a supporting member linked, relative to the holding member, in a position axially-internal to the holding member and movable between a first operating condition, wherein the supporting member is axially-spaced-apart from the holding member to provide a supporting seat to at least one ply that is part of the carcass sleeve, and a second operating condition, wherein the supporting member is disposed axially close to the holding member to enable mutual approaching of the halves;

wherein the supporting members associated with the first and second halves, respectively, have abutment surfaces facing each other that are spaced apart from each other by an amount smaller than a stroke carried out by the halves between the spaced-apart condition and the approaching condition, and wherein the supporting members abut against each other by respective abutment surfaces in the approaching condition.

21. (new) The apparatus of claim 20, wherein the supporting member is slidably engaged along at least one guide rod extending in cantilevered fashion from the holding member.

22. (new) The apparatus of claim 21, wherein the at least one guide rod extends in parallel to the geometric axis of the drum.

23. (new) The apparatus of claim 20, comprising at least one elastic return member operatively associated with the supporting member to elastically urge the supporting member away from the holding member.

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24. (new) The apparatus of claim 21, comprising at least one return spring associated with the at least one guide rod to elastically urge the supporting member away from the holding member.

25. (new) The apparatus of claim 21, wherein the guide rods of the supporting members associated with the first and second halves, respectively, are angularly offset relative to each other.

26. (new) The apparatus of claim 20, wherein each supporting member of the first half may be translated toward a respective holding member due to a thrust action caused by one or more supporting members of the second half during mutual approaching of the halves, and wherein each supporting member of the second half may be translated toward a respective holding member due to a thrust action caused by one or more supporting members of the first half during mutual approaching of the halves.

27. (new) The apparatus of claim 20, wherein the supporting members associated with each of the halves define a substantially-continuous cylindrical supporting surface under a radially-expanded condition.

28. (new) The apparatus of claim 20, wherein each of the supporting members has end slots slidably housing end projections provided on circumferentially-adjoining supporting members.

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29. (new) The apparatus of claim 20, wherein each of the holding members comprises an axially-inner portion and an axially-outer portion, movable selectively and independently of each other under action of the radial-movement devices.

30. (new) The apparatus of claim 20, wherein the radial-movement devices comprise:
a supporting hub coaxial with the geometric axis of the drum, slidably engaging the holding members of respective radial sectors in a direction radial to the geometric axis of the drum;

at least one radial-movement actuator operatively engaged with the supporting hub and axially movable relative thereto; and

transmission connecting rods operatively engaged between the at least one radial-movement actuator and the holding member of one of the radial sectors to cause a radial movement of the holding member following an axial movement transmitted by the at least one radial-movement actuator.

31. (new) The apparatus of claim 29, wherein the radial-movement devices comprise:
a supporting hub coaxial with the geometric axis of the drum;
first guide elements for slidably engaging the axially-inner portions of the holding members with the supporting hub, in a direction radial to the geometrical axis of the drum;

at least one first radial-movement actuator operatively engaged with the supporting hub and axially movable relative thereto;

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first transmission connecting rods operatively engaged between the at least one first radial-movement actuator and one of the axially-inner portions to cause a radial movement of the axially-inner portion following an axial movement transmitted by the at least one first radial-movement actuator;

second guide elements for slidable engaging the axially-outer portions of the holding members with the supporting hub, in a direction radial to the geometric axis of the drum;

at least one second radial-movement actuator operatively engaged with the supporting hub and axially movable relative thereto; and

second transmission connecting rods operatively engaged between the at least one second radial-movement actuator and one of the axially-outer portions to cause a radial movement of the axially-outer portion following an axial movement transmitted by the at least one second radial-movement actuator.

32. (new) The apparatus of claim 31, wherein the axially-inner portions of the holding members include powered axially-inner portions and driven axially-inner portions, wherein the powered axially-inner portions are operated by respective radial-movement devices, and wherein the driven axially-inner portions are dragged along by the radial movement of the powered axially-inner portions.

33. (new) The apparatus of claim 20, wherein at least one turning-up device is associated with each of the first and second halves to turn up a side edge of the carcass sleeve around a respective annular anchoring structure.

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34. (new) The apparatus of claim 33, wherein each turning-up device comprises:
a plurality of turning-up levers circumferentially distributed around the geometric axis of
the drum, each carrying at least one pressure element facing the drum;
at least one driving member rotatably engaging each of the turning-up levers at a hinging
point spaced apart from the at least one pressure element;
operation devices to axially translate the at least one driving member between a rest
position, wherein the driving member is axially-spaced-apart from the radial sectors, and a
working position, wherein the driving member is disposed close to the radial sectors.

35. (new) The apparatus of claim 34, wherein the hinging point of each of the turning-
up levers has, relative to the geometric axis of the drum, a radial distance smaller than a radial
distance measured from a corresponding pressure element when the driving member is in a rest
position.

36. (new) The apparatus of claim 34, wherein the holding member of each radial sector
has, at an axially-outer position, a lead-in surface converging towards the geometric axis of the
drum and facing the pressure element carried by at least one of the turning-up levers.

37. (new) The apparatus of claim 34, wherein each turning-up device comprises at least
one elastic element extending around the geometric axis of the drum and operating on the
turning-up levers to transmit to the turning-up levers a radial-thrust action toward the geometric
axis of the drum.--

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REMARKS

Applicant submits this Preliminary Amendment together with an Appendix to Amendment Dated January 11, 2002, and a patent application under 37 C.F.R. § 1.53(b).

In this Preliminary Amendment, Applicant amends the title and adds section headings, section subheadings, and an Abstract of the Disclosure to conform to U.S. practice. Applicant also amends the specification to conform the specification to International Application No. PCT/EP00/05972. Additionally, Applicant adds claims to the right of priority and benefit. Further, Applicant cancels, without prejudice or disclaimer, claims 2-19, and adds new claims 20-37, which include the same subject matter as the original claims, to improve clarity. The originally-filed specification, claims, abstract, and drawings fully support the amendments to the specification and the addition of new claims 19-36. No new matter was introduced.

If there is any fee due in connection with the filing of this Preliminary Amendment, please charge the fee to our Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: January 11, 2002

By: _____


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Application Number: Not yet assigned
Filing Date: January 10, 2002
Attorney Docket Number: 7040.0117.00

APPENDIX TO PRELIMINARY AMENDMENT DATED JANUARY 11, 2002

Amendments to the Title

Please amend the title, as follows:

TYRE-ASSEMBLING APPARATUS

Amendments to the Specification

On page 5, line 26 - page 6, line 6, please amend the paragraph beginning "In more detail, it is an object of the present invention . . .", as follows:

In more detail, [it is an object of] the present invention [to] provides a tyre assembling apparatus, [characterized in that] wherein each of said sectors comprises: a holding member defining an engagement seat [for] of an annular structure [of] for anchoring to the [bead being] bead-part of a carcass sleeve fitted on said drum; and a supporting member linked, relative to said holding member, in a position axially internal to the latter and movable between a first operating condition, in which it is axially spaced apart from the holding member to offer a supporting seat to at least one ply being part of said carcass sleeve, and a second operating condition, in which it is disposed close to the holding member to enable mutual approaching of said halves. The supporting members associated with the first and second halves, respectively, have abutment surfaces both facing each other and spaced apart from each other by a smaller amount than the stroke carried out by said halves between their spaced-apart condition and their

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approaching condition. The respective abutment surfaces of the supporting members abut against each other in the approaching condition.

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ABSTRACT OF THE DISCLOSURE

A tyre-assembling apparatus includes an assembling drum, radial-movement devices, and at least one axial-movement actuator. The assembling drum includes first and second halves axially opposed along a geometric axis of the drum. Each of the halves includes a plurality of circumferentially-distributed radial sectors. The radial-movement devices associated with each of the halves selectively translate corresponding radial sectors between a contracted condition and an expanded condition. The at least one axial-movement actuator translates the halves relative to each other between an approaching condition and a spaced-apart condition. Each of the radial sectors includes a holding member and a supporting member. The holding member defines an engagement seat of an annular anchoring structure to a bead-part of a carcass sleeve fitted on the drum. The supporting member is linked, relative to the holding member, in a position axially-internal to the holding member and movable between first and second operating conditions.

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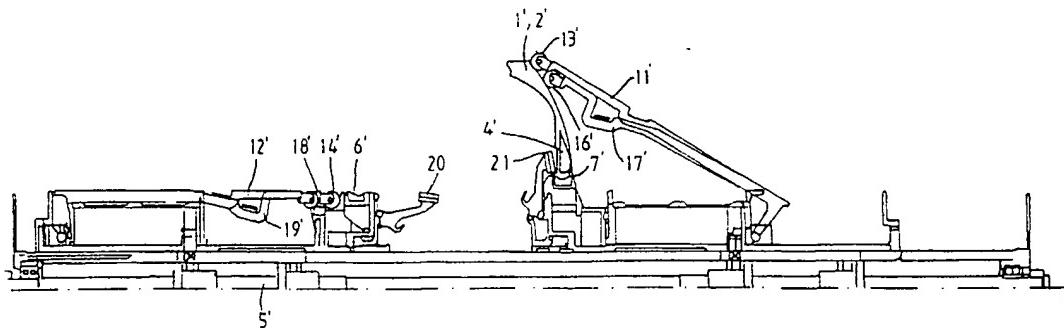
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(54) Title: TYRE BUILDING DRUM WITH TURN-UP APPARATUS



(57) Abstract

Tyre building drum with turn-up apparatus for building an unvulcanized tyre with tyre components (1, 2) and two bead cores (3, 4) with high bead filling strips (4'). Said drum has two ring segments (6, 7) spaced from each other in order to support a bead core, drum segments (8, 9, 10, 11, 12) placed on the outside of each ring segment in order to support the tyre components. Said drum further has means to radially expand that part of the tyre components which is situated between the ring segments. Said tyre building drum has on both sides outside the ring segments a first and second set of axially extending, hingeable arms (11, 12, 17, 19) each having an end directed to the ring segment, said end having a roller (13, 14, 16, 18) and means to axially and radially move each set of arms from a first position in which the rollers of a set of arms form a virtually closed ring to a second position in order to press the expanded part of the tyre components which is situated between the ring segments to the part of the tyre components which is situated outside the ring segments. Each roller (16, 18) of an arm (17, 19) of the second set is situated between two adjacent arms (13, 14) of said first set and situated on the side of the rollers of the arms of said first set which side is turned away from the ring segments.

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Tyre building drum with turn-up apparatus

The present invention relates to a tyre building drum with turn-up apparatus for building an unvulcanized tyre with tyre components of rubber or having reinforcement cords and two bead cores with high bead filling strips, said tyre
5 building drum having a central axis, two ring segments placed around the axis and spaced from each other each to support a bead core, drum segments placed around the axis and on the outside of each of the ring segments, which drum segments define a cylindrical surface to support tyre
10 components, means to radially expand that part of the tyre components which is situated between the ring segments, the tyre building drum having on both sides outside the ring segments a first set of axially extending, hingeable arms, each arm having an end directed at the ring segment, said
15 end having a roller, means to axially and radially move each first set of arms from a first position in which the rollers of a first set of arms form a virtually closed ring to a second position in order to press the expanded part of the tyre components which is situated between the ring seg-
20 ments to the part of the tyre components which is situated outside the ring segments.

Such a tyre building drum with turn-up apparatus is already known from British patent specification 1.532.960. This
25 known tyre building drum comprises two sets of arms, one set on one side outside of the ring segments and the other set on the other side outside of the ring segments. When moving the arms from the first position to the second position, rollers are brought at a greater distance from
30 the axis, as a result of which the rollers are distanced from each other and thus do not form a virtually closed ring any more. Because the second position is a little distance further from the central axis of the tyre building

drum than the first position, the part of the tyre components situated outside the ring segments is not fully pressed over the total height to the part of the tyre components situated between the ring segments, and furthermore
5 the ends of the arms come to stand at a distance from each other so that an incomplete circumferential pressure by the rollers is obtained. In order to prevent an incomplete attachment of the tyre components, which may be detrimental to the quality of the tyre to be produced, a sleeve of
10 rubber is applied around the arms. Such a sleeve of rubber however, has a limited life span.

The object of present invention is to provide a tyre building drum with turn-up apparatus for building an unvulcanized tyre with tyre components of rubber or having reinforcement cords and two bead cores with high bead filling strips, wherein without the use of a rubber sleeve
15 the parts of the tyre components can be pressed to one another over their full circumference and their full height, so that the final quality of the tyre to be produced is improved.
20

For this purpose a tyre building drum with turn-up apparatus of the kind described above is according to the
25 invention characterized in that each first set of arms contains a second set of axially extending, hingeable arms, each arm having an end directed at the ring segment, said end having a roller, each roller of an arm of the second set being situated between two adjacent arms of said first set and being situated on the side of the rollers of the arms of said first set which side is turned away from the ring segments, and that means are provided to axially and
30 radially move each second set of arms from a first position, in which the rollers of a second set of arms form a virtually closed ring to a second position in order to press the expanded part of the tyre components which is situated between the ring segments to the part of the tyre
35

- components which is situated outside the ring segments. Because the rollers of the arms of the second set are situated between the arms of the first set, at least almost the entire circumference of the tyre component parts is 5 pressed to one another in the second position of the rollers of both sets, as a result of which an at least almost complete attachment of the tyre components is obtained.
- 10 A preferred embodiment of a tyre building drum with turn-up apparatus according to present invention is characterized in that the means to axially and radially move each first set of arms and the means to axially and radially move each second set of arms are formed by the same means. In this 15 way the turn-up apparatus of the tyre building drum cannot only be manufactured in a more compact design, but also moving the sets of arms from the first position to the second position is synchronized in a simple way.
- 20 A further preferred embodiment of a tyre building drum with turn-up apparatus according to the invention is characterized in that means are provided for laterally supporting the two bead cores with high bead filling strips, wherein the means are situated between the ring segments and 25 preferably are pivotable from a non-working position to a working position. In this way it is prevented that when the arms are going from the first position to the second position, the arms push the bead cores with high bead filling strips from their places. When the means are 30 pivotable from a non-working position to a working position, the normal working of the tyre building drum is not detrimentally influenced.
- 35 By way of example, some embodiments of a tyre building drum with turn-up apparatus according to the invention will be described on the basis of the drawing. Therein:

Figure 1 schematically shows a longitudinal cross section of an tyre building drum with turn-up apparatus according to the invention, the arms being in the first position,

5 Figure 2 schematically shows a longitudinal cross section of an tyre building drum with turn-up apparatus according to the invention, the arms being in the second position and the part of the tyre components which is situated between the ring segments, being expanded,

10

Figure 3 schematically shows a longitudinal cross section of an alternative embodiment of the tyre building drum with turn-up apparatus according to the invention, wherein in the left half of the figure the arms are shown in the first 15 position and in the right half of the figure the arms are shown in the second position,

Figure 4 schematically shows in perspective one set of arms 20 in a first position and some parts of the turn-up apparatus of the tyre building drum according to the invention in order to exemplify the three-dimensional configuration, and

Figure 5 schematically shows in perspective one set of arms 25 in a second position and some parts of the turn-up apparatus of the tyre building drum according to the invention in order to exemplify the three-dimensional configuration.

Figure 1 schematically shows a longitudinal cross section 30 of the tyre building drum with turn-up apparatus according to the invention for building an unvulcanized tyre. Such an unvulcanized tyre contains tyre components of rubber or having reinforcement cords (of which in figure 1 two, 1 and 2 are shown) and two bead cores 3 and 4 with high bead filling strips. The number and kind of tyre components are 35 dependent on the final tyre to be produced, and the possible assemblies and construction are sufficiently known to

an expert, so a more detailed discussion of this will be omitted.

The tyre building drum has a central axis 5. Around the axis 5 and spaced from each other two ring segments 6 and 7 are situated, each to support a corresponding bead core 3 respectively 4. Around the axis 5 and on the outside of each ring segment 6, 7 drum segments 11 and 12 are situated, which drum segments define a cylindrical surface to support the tyre components 1, 2. The ring segments 6, 7 can also serve to support certain tyre components, such as relatively narrow reinforcement strips.

Figure 1 shows an example of a tyre building drum, in this case also with drum segments 8, 9 and 10 between the ring segments. As already known there are means (not represented in the figure) to radially move at least a part of the drum segments (particularly drum segment 8), and means (not represented in the figure) to - for instance by way of air pressure - radially expand that part of the tyre components which is situated between the ring segments 3, 4.

The tyre building drum on both sides outside the ring segments 6, 7 has a first set of axially extending, hingeable arms 11 respectively 12. Each arm 11, 12 has an end directed at the ring segment 6, respectively 7, said end having a roller 13, respectively 14. As already known there are means (15, figure 2) to axially and radially move each first set of arms 11, 12 from a first position (represented in figure 1) in which the rollers 13, 14 of a first set of arms 11, 12 form a virtually closed ring to a second position (represented in figure 2) to press the expanded part of the tyre components which is situated between the ring segments 6, 7 to the part of the tyre components which is situated outside the ring segments 6, 7.

In the following the feature of the tyre building drum which is essential for the invention will be further gone into, which is the turn-up apparatus, and other components of the tyre building drum, which are sufficiently known to 5 the expert, will not be described in detail.

According to the invention a tyre building drum with turn-up apparatus is provided in which each first set of arms 10 (11 or 12) contains a second set of axially extending hingeable arms (17 respectively 19, see figure 2 and 4). Each arm 17, 19 of each second set has an end directed at the ring segment 6 respectively 7, said end having a roller 16 respectively 18. Each roller 16, 18 of an arm 17, 19 of each second set is situated between two adjacent arms 11, 15 12 of the said first set, each roller 16, 18 of the second set being situated on the side of the rollers 13, 14 of the arms 11, 12 of said first set, which side is turned away from the ring segments 6, 7.

20 Furthermore there are means, preferably the means 15, to axially and radially move each second set of arms from a first position in which the rollers 16, 18 of the second set of arms 17, 19 form a virtually closed ring to a second position in order to press the expanded part of the tyre 25 components which is situated between the ring segments 6, 7 to the part of the tyre components which is situated outside the ring segments 6, 7. The means to axially and radially move the set of arms preferably comprise flexible bands, arranged around the set of arms in order to press 30 the arms from the second position back to the first position.

Because the rollers 16, 18 of the arms 17, 19 of the second set are situated between the rollers 13, 14 of the arms 11, 35 12 of the first set, in the second position of the rollers of both sets almost the entire circumference of the tyre component parts is pressed to one another (as represented

in figure 2 and 5) as a result of which an almost complete attachment of the tyre components is obtained.

Figure 3 schematically shows a longitudinal cross section (only the upper half is shown, the lower half is symmetric) of an alternative known embodiment of the tyre building drum with turn-up apparatus according to the invention for building an unvulcanized tyre. Such an unvulcanized tyre consists of tyre components of rubber or having reinforcement cords, of which in the right half of figure 3, two, 1' and 2', are shown, and two bead cores with high bead filling strips, of which only one 4' is shown. The tyre building drum has a central axis 5'. Around the axis 5' and spaced from each other two ring segments 6' and 7' are situated, each to support a corresponding bead core. Ring segments 6' and 7' serve to support the tyre components 1' and 2'. Initially two sets of arms 11', 17' and 12', 19' when they are in the first position are used for supporting the part of the tyre components that is outside the ring segments. Each arm 11', 12' (17', 19') has an end directed at the ring segment 6', respectively 7', said end having a roller 13', respectively 14' (16', 18'). Each set of arms can be moved from a first position (shown in the left half of figure 3) in which the rollers of a set of arms form a virtually closed ring to a second position (shown in the right half of figure 3) in order to press the expanded part of the tyre components that is between the ring segments 6', 7' to the part of the tyre components which is outside the ring segments 6', 7'.

Each roller 16', 18' of an arm 17', 19' of each second set is situated between two adjacent arms 11', 12' of said first set, each roller 16', 18' of the second set being situated on the side of the rollers 13', 14' of the arms 11', 12' of said first set, which side is turned away from the ring segments 6', 7'.

Because the rollers 16', 18' of the arms 17', 19' of the second set are situated between the rollers 13', 14' of the arms 11', 12' of the first set, in the second position of the rollers of both sets, almost the entire circumference 5 of the tyre component parts are pressed to one another, wherein also without the use a sleeve of rubber an almost complete attachment of tyre component parts is obtained.

Furthermore means 20, 21 (figure 3) are provided to laterally support said two bead cores with high bead filling strips of which one 4' is shown in figure 3, in which the means are situated between the ring segments 6', 7'. Said means, when in working position, prevent that the arms when going from a first position to a second position, from unwontedly pushing the bead cores with high bead filling strips from the ring segments. Preferably the means 20, 21 for laterally supporting the bead cores with high bead filling strips are pivotable from a non-working position to a working position. In this way the means for laterally supporting the bead cores with high bead filling strips do not impede the normal working of the tyre building drum, 15 and moreover can help supporting the tyre components in the starting position. 20

25 AS/NG

Claims

1. Tyre building drum with turn-up apparatus for building an unvulcanized tyre with tyre components of rubber or having reinforcement cords and two bead cores with high bead filling strips, said tyre building drum having a central axis, two ring segments placed around the axis and spaced from each other each to support a bead core, drum segments placed around the axis and on the outside of each of the ring segments, which drum segments define a cylindrical surface to support tyre components, means to radially expand that part of the tyre components which is situated between the ring segments, the tyre building drum having on both sides outside the ring segments a first set of axially-extending, hingeable arms, each arm having an end directed at the ring segment, said end having a roller, means to axially and radially move each first set of arms from a first position in which the rollers of a first set of arms form a virtually closed ring to a second position in order to press the expanded part of the tyre components which is situated between the ring segments to the part of the tyre components which is situated outside the ring segments, **characterized in that**, each first set of arms contains a second set of axially extending, hingeable arms, each arm having an end directed at the ring segment, said end having a roller, each roller of an arm of the second set being situated between two adjacent arms of said first set and being situated on the side of the rollers of the arms of said first set, which side is turned away from the ring segments, and that means are provided to axially and radially move each second set of arms from a first position in which the rollers of a second set of arms form a virtually closed ring, to a second position in order to press the expanded part of the

- 10 -

tyre components which is situated between the ring segments to the part of the tyre components which is situated outside the ring segments.

- 5 2. Tyre building drum with turn-up apparatus according to claim 1, **characterized in that**, the means to axially and radially move each first set of arms and the means to axially and radially move each second set of arms are formed by the same means.
3. Tyre building drum with turn-up apparatus according to claims 1 or 2, **characterized in that**, means are provided to laterally support the two bead cores with high bead filling strips, wherein the means are situated between the ring segments.
4. Tyre building drum with turn-up apparatus according to claim 3, **characterized in that** the means to laterally support the bead cores with high bead filling strips are pivotable from a non-working position to a working position.

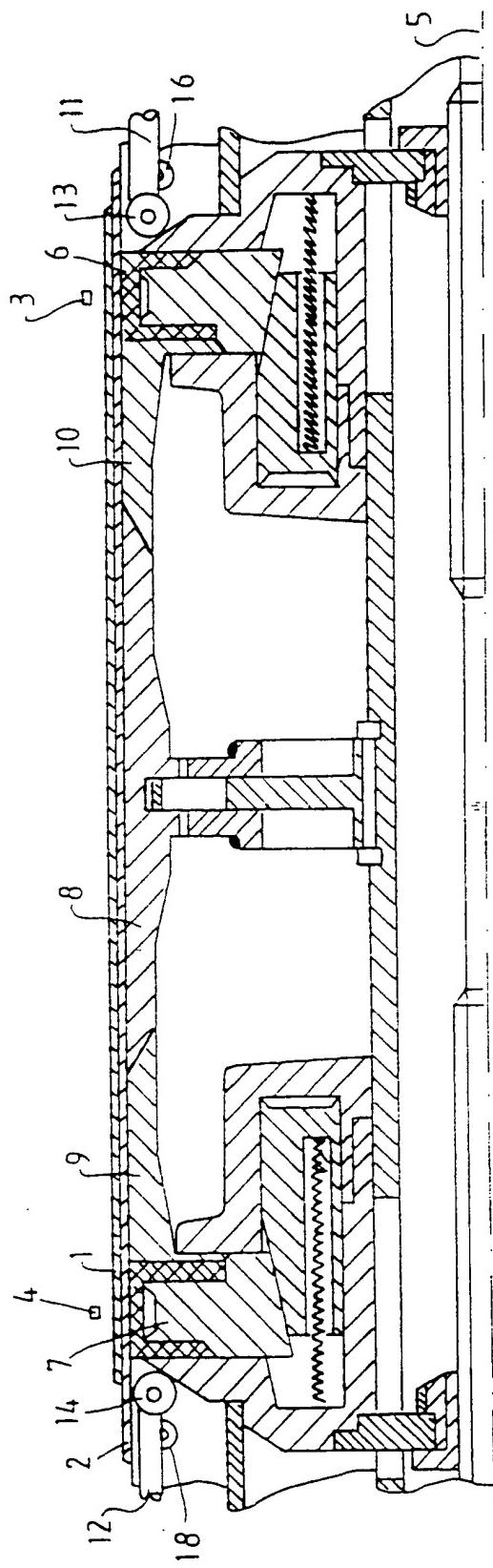
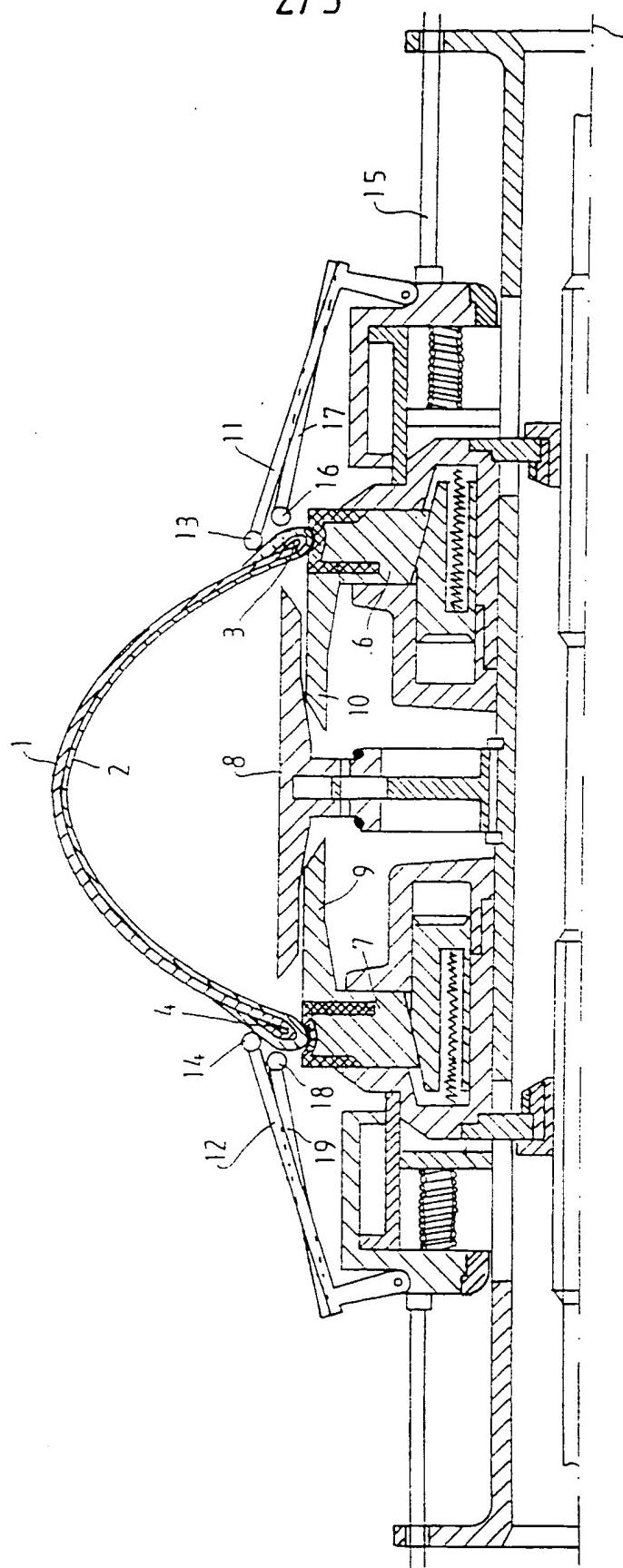


FIG. 1

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FIG. 2



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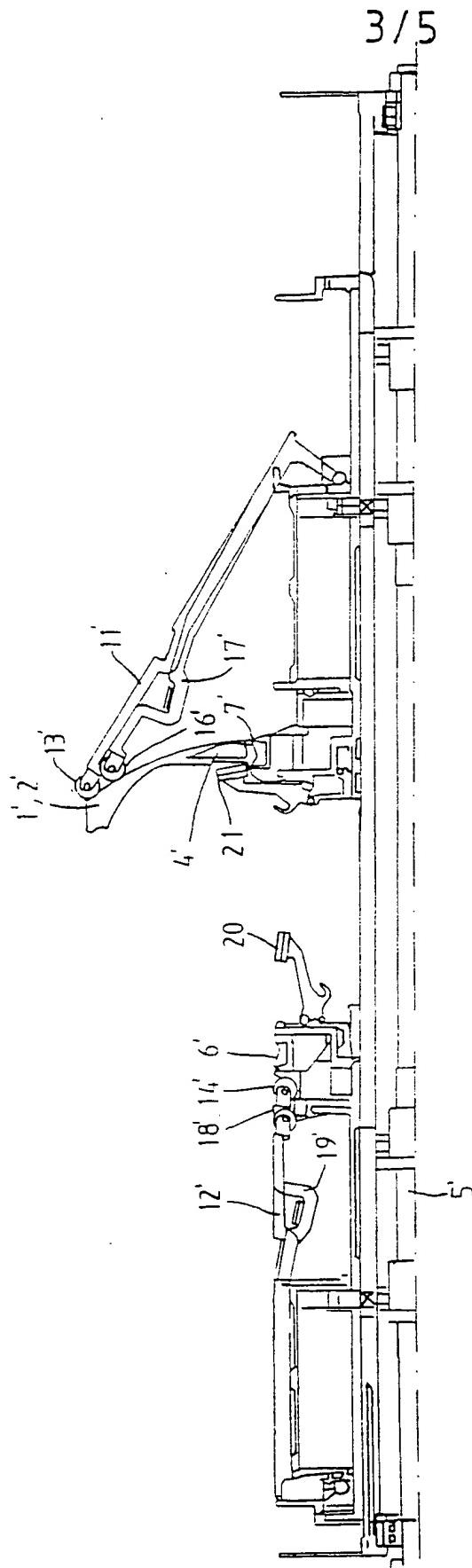


FIG. 3

FIG. 4

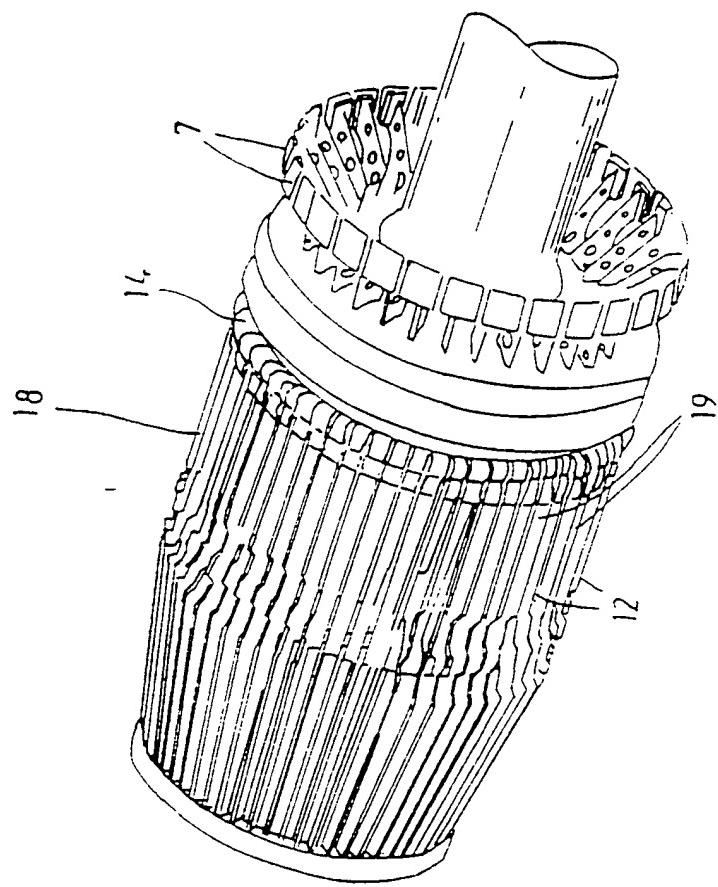
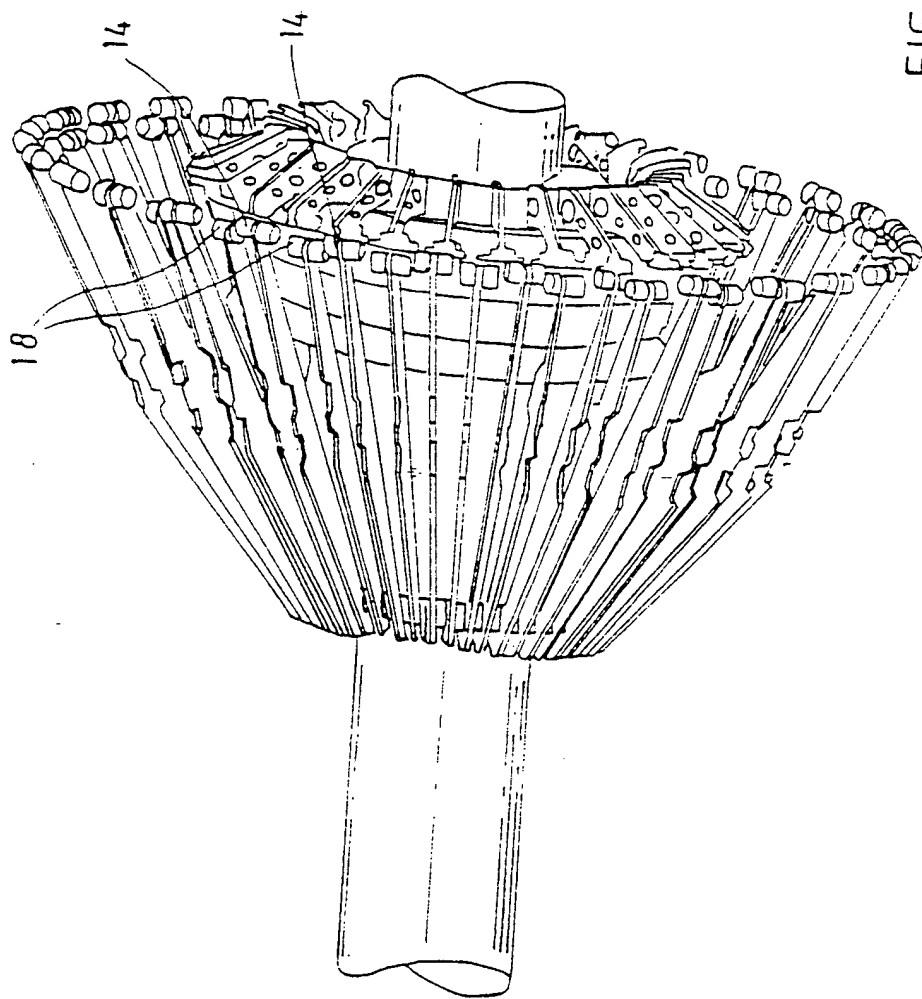


FIG. 5



INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
 IPC 6 B29D30/32 B29D30/24

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'X' document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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Date of the actual completion of the international search

20 January 1998

Date of mailing of the international search report

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Name and mailing address of the ISA

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Authorized officer

Fregosi, A

INTERNATIONAL SEARCH REPORT

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|---|
| International Application No PCT/NL 97/00435 |
|---|

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| Category | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No |
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1733
PATENT
Customer No. 22,852
Attorney Docket No. 7040.0117.00
IFW

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:)
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Adamo SALA)
)
Application No. 10/042,184) Group Art Unit: 1733
)
)
Filed: January 11, 2002) Examiner: Knable, G.
)
For: TYRE-ASSEMBLING APPARATUS)

Mail Stop Petition

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

TRANSMITTAL LETTER

The items checked below are attached:

- Petition to Accept Originally Filed Application (2 pages);
- Copy of Cover Letter filed January 11, 2002 (3 pages);
- Copy of Stamped Receipt Card dated January 11, 2002 (1 page);
- Form PTO 1449 (1 page);
- International Publication No. WO 01/08,874 (29 pages);
- Preliminary Amendment (11 pages);
- Appendix to Preliminary Amendment (2 pages);
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Application No. 10/042,184
Attorney Docket No. 7040.0117.00
Transmittal Letter—Filed July 1, 2004

Please grant any extensions of time required to enter this response and charge any additional required fees to our Deposit Account No. 06-0916.

Respectfully submitted,

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Dated: July 1, 2004

By: _____

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